

Editorial

Schistosomiasis Disease Burden in Zambian Children: Time for affirmative action is now

*James Chipeta^{1,2}, James Mwansa³ and John S Kachimba⁴

¹University of Zambia School of Medicine, Department of Paediatrics and Child Health, P.O. Box 50110, Lusaka, Zambia

²The School of Medicine and University Teaching Hospital Malaria Research Unit (SMUTH-MRU), C/O University teaching Hospital, Department of Paediatrics and Child Health, D-Block, P/B RWIX, Lusaka, Zambia

³University Teaching Hospital, Department of Pathology and Microbiology, P.O. Box 50110, Lusaka, Zambia and the Zambia Bilharzias Control Program(ZBCP)

⁴University Teaching Hospital, Department of Surgery, P.O. Box 50110, Lusaka, Zambia

The accompanying photograph to this editorial on the schistosomiasis burden in Zambian children is interesting but sad (Figure 1). Three girls, at one of our public schools, are pictured holding eye-catching containers with identical fluids. The unfortunate and

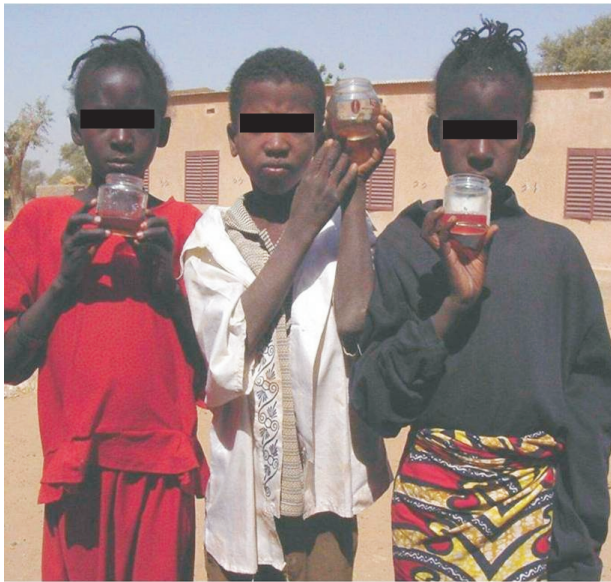


Figure 1. Three girls of a public school holding containers of their respective Gross haematuric urine (Courtesy of the Zambia Bilharzias Control Program-ZBCP)

sad fact is that the fluid each girl is holding is not 'coca-cola' but their respective bloody urine. These were three of the many school pupils found out to have urinary schistosomiasis (Bilharzia) at a routine schistosomiasis screening campaign tour by the Zambia Bilharzia Control Program (ZBCP) team. This and two articles (Chabala C, et al and Shawa TS, et al) appearing in this issue have attracted the attention of this journal's editorial team to comment on schistosomiasis disease burden in Zambian children.

In recent times the developed Western World has coined an embracing and diplomatic terminology, *Neglected Tropical Diseases* (NTDs), to describe ancient-old human scourges of Schistosomiasis, Ascariasis, Filariasis, Leishmaniasis, Leprosy, Trypanosomiasis, Onchocerciasis, Trachoma, Chagas' disease and the like that continue to be a menace in the tropics especially Sub-Saharan Africa¹⁻³. These NTDs comprise a total of 13 major disabling conditions that are among the most common chronic infections now estimated to afflict a staggering 2.7 billion people in the developing tropical and sub tropical countries. The term, NTDs, is 'embracing' and 'diplomatic' as it tactfully avoids the name *Diseases of Poverty* (DoP) or, better, *Poverty Defining Diseases* (PDDs). The lead author of this editorial feels the latter are more accurate terminologies for NTDs and better describe these diseases. However, in the current paradigm of

Correspondence:

*Dr. James Chipeta

e-mail: damaseke@yahoo.com or
Jameschipeta@smuth-mru.org.zm

'globalization' and 'global health' NTDs is a preferred term to PDD and DOPs. This becomes apparent when one asks the question, 'who has neglected these diseases?'. Promptly comes the answer from the developed world nations, 'We have and we are ready to help you now'. At the peak of all this the developing tropical world, more less out of some sort of stupor, quickly get soothed by this diplomacy believing that they are not the ones who have neglected these diseases and therefore they are entitled to be helped out by those who neglected them in the first place. How ironical is the whole scenario surrounding the NTDs! Well, we shall hasten and move away from semantics surrounding the acronym NTDs which is not the focus of this editorial. Our focus is on one of these NTDs, Schistosomiasis, that current literature reports to be a major public health problem in more than 70 tropical and subtropical countries and yet it is not making much headlines on global health news in comparison to say HIV/AIDS, Malaria and Tuberculosis. Particularly we would like to bring to the attention of this journal's readership the schistosomiasis disease burden in our country, Zambia and more so among Zambian children as has been availed by research conducted recently and over the past several decades.

Unabated Disease Burden in Zambian Children

There is a wealth of literature on schistosomiasis in Zambia dating back from as early as the late 19th century during Dr. David Livingstone's times and the great trek of the Ngonis into this country. **Michelson** in an elaborate review catalogued this schistosomiasis data documenting the distribution of five species of the mammalian schistosomes occurring in Zambia giving details of their respective snail hosts, human prevalence, and their role in producing disease morbidity in the Zambian Population⁴. In the same review updated status of the infection and disease in the country as well as considerations of transmission and control were ably discussed. Such elaborate studies on schistosomiasis in Zambia that was the source of Michelson's work was work by **Boatin BA**, et al who reported nationwide *Schistosoma haematobium* disease prevalence of 16.8% with a range of 2-40%⁵. Meanwhile *S. mansoni* disease prevalence countrywide ranged from 0-77%. The disease is, indeed, endemic throughout the country (Figure 2). Alongside this epidemiological data on

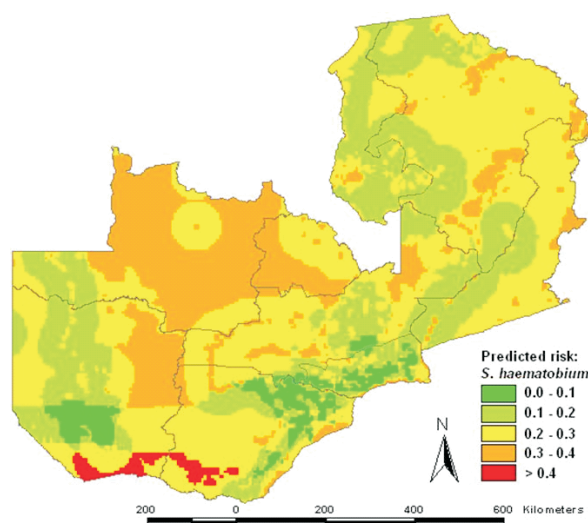


Figure 2. Risk Map of Schistosomiasis in Zambia

schistosomiasis in the country is the accumulative clinical data documenting the disease burden with regard to debilitating and fatal long term complications. Enormous work by the then celebrated University Teaching Hospital (UTH) surgeon and urologist, Elem B⁶⁻⁹ in the '80s among several other studies¹⁰⁻¹⁵ documented the far reaching chronic effects of schistosomiasis disease in the country ranging from various chronic urogenital and gastrointestinal pathologies to malignant complications such as prostatic, cervical and bladder carcinoma. Worldwide, Schistosomiasis disease burden has its biggest toll in children with a varied spectrum of morbidity including recurrent ill health leading to impaired growth and development, anaemia, cognitive problems leading to poor school performance, chronic gastrointestinal pathologies such as liver cirrhosis, and portal hypertension. Indeed schistosomiasis disease prevalence and morbidity is high among children in our country¹⁰⁻¹⁹. In view of this compelling evidence of high schistosomiasis disease burden substantial research has also been conducted in the country to find solutions of abating the scourge especially in children. Noteworthy are the clinical trials and pilot study interventions by Sukwa TY, et al²⁰⁻²² at Tropical Diseases Research Centre (TDRC) and work by researchers at University of Zambia's Department of Biological sciences²¹⁻²³. These studies demonstrated that control and eradication of the disease is possible by combining mass chemotherapy of school going

children and snail-vector control by use of molluscides and environmental management.

What is nostalgic of this handy and important evidence of schistosomiasis disease burden especially among Zambian children is the fact raised by Chabala et al's case report in this issue. Going by this report and the girls in our editorial picture, both Dr. David Livingstone and Zongendaba of the Ngoni people, coming out of their graves, would not be much amazed by any modernity in our country. The state of health of our children has remained virtually the same as it was in the 19th century as far as schistosomiasis disease burden in children is concerned. The disease appears to have remained unabated in Zambia over all this time. In a short span of the past six months (December 2008-May 2009) besides this case reported here, Chabala et al have seen two other children with complicated schistosomiasis. Both these children were referrals from Northern Province, had liver pathology, hypersplenism and had to undergo splenectomy. Indeed recent schistosomiasis disease surveillance studies indicate that the prevalence has remained the static if not worsening especially in view of the HIV/AIDS pandemic and increasing poverty levels²⁵⁻²⁸. The question is, 'why has the wealth of research evidence not been utilized to control the disease in the country?' 'Why are we as a country not mobilizing similar resources as we are doing against HIV/AIDS, Malaria and Tuberculosis so that the scourge is abated and finally eradicated?'

Novel evidence on Disease Pathogenesis

To date no infectious disease has been eradicated without novel innovation in basic research and public health. Smallpox could not have been eradicated had it not been for the innovative work of Edward Jenner leading to the discovery of the Pox vaccine and subsequent public health vaccine campaigns worldwide. It is with this background that this editorial draws your attention to our lead article by Shawa et al titled 'Changes in Serum Cytokine Concentration after Praziquantel Treatment in Zambian Children with Schistosomiasis'. The wholemark of Schistosomiasis pathology is as a result of the host immune response to the thousands of schistosoma ova deposited in various body tissues leading to granuloma formation and fibrosis²⁹ as was

the case in Chabala et al's case report. Cytokines are the mediators of this immune reaction and play critical roles in schistosomiasis pathology. It is currently hypothesized that treatment of *Schistosoma mansoni* with praziquantel can alter significantly the immune response of patients and generate a reversal of the level of fibrosis and thereby ameliorate the disease complications²⁹. Shawa et al's work is thus adding to the body of knowledge and evidence that is currently accumulating regarding this role of cytokines in schistosomiasis pathology. Their finding of low serum levels of transforming growth factor β (TGF- β) after treatment with praziquantel in children with schistosomiasis is significant and may need further studies. Recently TGF- β signaling has been shown to be critical in the *S. mansoni* embryo growth³⁰⁻³¹. With further studies and elucidation novel vaccines and drugs utilizing TGF signal pathways are bound to be discovered leading to new effective ways of controlling and combating the disease.

Need for affirmative action

While the questions asked above may not have immediate solutions, absolute solutions to the problem are not far placed if we revert to earlier semantics on the terminology, NTDs. The reason why NTD is preferable and more diplomatic to PDDs and DoP is for the simple reason that alleviation of poverty is costly and none of the developed world nations are 100% ready to meet the total cost. So it is more diplomatic and preferable to use the term NTDs to using the terms PDD or DoP. With the latter term it would be obvious that the root causes and actual reason why the 13 NTDs are still menacing the developing world is due to poverty. Hence whoever, is responsible should deal with poverty so as to eradicate them. For the developing world and especially us in Sub-Saharan Africa the message is simple we should understand these NTDs as PDD or DoP and thus come out of our stupor and address poverty as we steadily combat the scourges. Who has neglected NTDs in Zambia? Yes, who has neglected Schistosomiasis disease burden among our children in the country? It is not them but us as a nation. Other nations, such as China and India, who only a while ago were like us have realized this and are making headways in combating these diseases resulting into having healthy children and thereby being assured of

a bright future³². With the prevailing international goodwill towards combating the NTDs as recently shown by Bill and Melinda Gates²⁸ we resolve that the time for affirmative action against Schistosomiasis disease burden in children is now. This affirmative action, as prescribed and well articulated by Ebrahim GJ³ entails the following;

- political commitment;
- clear objectives with realistic time frames;
- Use of targeted proven interventions;
- establishment of publicprivate partnerships where required;
- long-term stable financing and donation of drugs;
- monitoring and evaluation systems;
- programme-oriented research as an embedded activity.

REFERENCES

1. Hotez PJ, Molyneux DH, Fenwick A, et al. Control of neglected tropical diseases. *N Engl J Med* 2007; 357:1018-26.
2. Molyneux DH. 'Neglected' diseases but unrecognized successes challenges and opportunities for infectious disease control. *Lancet* 2004; 364:3803
3. Ebrahim GJ. Neglected Tropical Diseases. *Journal of Tropical Pediatrics* 2009 ; 55(3):141-4
4. Michelson EH. Schistosomiasis in Zambia: an historical overview and review of the literature. *Afr J Med Med Sci*. 1989 Dec; 18(4):269-81.
5. Boatin BA, Wurapa FK, Ulrich AM. The prevalence and distribution of schistosomiasis in Zambia. *Cent Afr J Med*. 1985 Sep; 31(9):170-6.
6. Elem B. Preliminary nephrostomy and total ileal replacement of both ureters in advanced bilharzial obstructive uropathy. *Br J Urol*. 1989 May; 63(5):453-6.
7. Elem B, Purohit R. Carcinoma of the urinary bladder in Zambia. A quantitative estimation of *Schistosoma haematobium* infection. *Br J Urol*. 1983 Jun; 55(3):275-8.
8. Elem B, Vandal MT. Bilharziasis of the urinary tract in Zambia. (Observation on 100 consecutive cases). *Med J Zambia*. 1981 Aug-Oct; 15(4):48-51.
9. Patil PS, Elem B. Schistosomiasis of the prostate and the seminal vesicles: observations in Zambia. *J Trop Med Hyg*. 1988 Oct; 91(5):245-8.
10. Fine J. Hydronephrosis in a series of 3,400 post-mortem examinations in Zambia, with special reference to Bilharzia. *Med J Zambia*. 1975 Aug-Sep; 9(4):98-101.
11. Lowenthal MN, Hutt MS, Jones IG, Mohelsky V, O'Riordan EC, Scott GL. Massive splenomegaly in Northern Zambia. II. Schistosomal splenomegaly and elevated IgG. *Trans R Soc Trop Med Hyg*. 1980; 74(1):99-103.
12. Lowenthal MN, Hutt MS, Jones IG, Mohelsky V, O'Riordan EC. Massive splenomegaly in Northern Zambia. I. Analysis of 344 cases. *Trans R Soc Trop Med Hyg*. 1980; 74(1):91-8.
13. Carruthers RH, Sinha P. Bilharzial portal fibrosis: an important cause of portal hypertension. *Ann R Coll Surg Engl*. 1978 Jan; 60(1):49-52.
14. Bhagwande SB. Schistosomiasis and carcinoma of the bladder in Zambia. *S Afr Med J*. 1976 Sep 25; 50(41):1616-20.
15. Sukwa TY, Bulsara MK, Wurapa FK. The relationship between morbidity and intensity of *Schistosoma mansoni* infection in a rural Zambian community. *Int J Epidemiol*. 1986 Jun; 15(2):248-51.
16. Ng'andu NH, Nkowane BM, Watts TE. The health status of rural primary schoolchildren in Central Zambia. *J Trop Med Hyg*. 1991 Jun; 94(3):169-74.
17. Buncombe LM, Chadian SK, Madsen H. Schistosomiasis around Siavonga, on the shores of lake Kariba, Zambia. *Ann of Trop Med Parasitology*. 1993 August; 87(4):365-71.
18. Mungomba LM, Michelson EH. Urban schistosomiasis in Lusaka, Zambia: a preliminary study. *J Trop Med Hyg*. 1995 June; 98(3):199-203.
19. Mungomba LM, Kalumba K. Validation of schistosomiasis morbidity symptoms in schoolchildren of Siavonga, Lake Kariba, Zambia. *Ann Trop Med Parasitol*. 1995 Aug; 89(4):439-42.
20. Sukwa TY, Boatin BA, Wurapa FK. A three year follow-up of chemotherapy with praziquantel in a rural Zambian community endemic for schistosomiasis mansoni. *Trans R Soc Trop Med*

- Hyg.* 1988; 82(2):258-60.
21. Sukwa TY. A community-based randomized trial of praziquantel to control schistosomiasis morbidity in schoolchildren in Zambia. *Ann Trop Med Parasitol.* 1993 Apr; 87(2):185-94.
 22. Sukwa TY, Bulsara MK, Wurapa FK. Reduction in prevalence, intensity of infection and morbidity due to *Schistosoma mansoni* infection in a community following treatment with praziquantel. *J Trop Med Hyg.* 1987 Aug; 90(4):205-11.
 23. Mubila L, Rollinson D. Snail-parasite compatibility and prevalence of *Schistosoma haematobium* on the shores of Lake Kariba, Zambia. *Ann Trop Med Parasitol.* 2002 Mar; 96(2):165-73.
 24. Hira PR. Seasonal population densities of snails transmitting urinary and intestinal schistosomiasis in Lusaka, Zambia. *Trop Geogr Med.* 1975 Mar; 27(1):83-92.
 25. van Vliet NG, de Jonge N, van Beers SM, and Lever P. A new focus of *Schistosoma mansoni* in the western province of Zambia. *Trop Geogr Med.* 1991 Jul; 43(3):323-5.
 26. Chimbari MJ, Dhlomo E, Mwadiwa E, Mubila L. Transmission of schistosomiasis in Kariba, Zimbabwe, and a cross-sectional comparison of schistosomiasis prevalences and intensities in the town with those in Siavonga in Zambia. *Ann Trop Med Parasitol.* 2003 Sep; 97(6):605-16.
 27. Modjarrad K, Zulu I, Redden DT, Njobvu L, Freedman DO and Vermund S. Prevalence and Predictors Of Intestinal Helminth Infections among Human Immunodeficiency Virus Type 1 Infected Adults in an Urban African Setting. *Am J. Trop. Med. Hyg.* 2005; 73(4):777-82.
 28. Kabatereine NB, Fleming FM, Nyandindi U, Mwanza JCL and Blair L. The control of schistosomiasis and soil transmitted helminths in East Africa. *Trends in Parasitology* 2006; 22 (7):332-339.
 29. Alves-Oliveira, Moreno LFEC, Gazzinelli G, Martins-Filho OA, Silveira AMS, Gazzinelli A, Malaquias LCC, LoVerde P, Martins Leite M, and Correa-Oliveira R. Cytokine production associated with periportal fibrosis during chronic schistosomiasis mansoni in humans. *Infect Immun.* 2006; 74:1215-1221.
 30. Freitas TC, Jung E, Pearce EJ. TGF- β Signaling Controls Embryo Development in the Parasitic Flatworm *Schistosoma mansoni*. *PLoS Pathog* 2007; 3(4):e52. Doi: 10.1371/journal.ppat.0030052
 31. LoVerde PT, Osman A, Hinck A. *Schistosoma mansoni*: TGF- β signaling pathways. *Experimental Parasitology* 2007; 117: 304-317.
 32. Utzinger J, Zhou XN, Chen MG, et al. Conquering schistosomiasis in China: the long march. *Acta Trop* 2005; 96:699-6.